

When to Continue a Legionellosis Outbreak Investigation

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Outline

- Criteria for initiating a comprehensive legionellosis outbreak investigation
- Role of an epidemiologic study
- Resources required for a comprehensive investigation
- Epi-Aid investigations
- Advice on media and legal issues

Suggested criteria for initiating a comprehensive investigation

- Two or more cases with an epi-link to a specific location and an environmental assessment suggestive of a problem
- One case with no alternative exposure and others potentially at increased risk (e.g., hospitals, nursing homes)
- Many cases clustered in place and time
- History of an outbreak in the setting of a new case
- Excessive public concern

Most legionellosis investigations start with case finding and an environmental assessment, but when do I need to do more?

Outbreak example #1

- City X reported a community outbreak of 7 cases of Legionnaires' disease in 7 weeks compared to 2 cases in the previous 10 years
- All cases were caused by *L. pneumophila* serogroup 1
- A single culture revealed the "Benidorm strain" by monoclonal antibody typing at CDC

Environmental investigation

- Sampling directed by early epidemiological findings and initial case exposures
 - No link to whirlpool spas, grocery store misters, healthcare settings
 - No link to any individual building
 - Outdoor source, e.g., cooling tower?
- Environmental assessment of city to locate aerosol-generating devices
- Samples collected from 286 water & biofilm samples from 119 potential sources at 72 sites

Environmental sources with *Legionella pneumophila* serogroup 1 (Lp1)

Source	No. positive / no. sampled (%)	Lp1 strain type
Case-patient homes	1/7 (14)	Oxford
Cooling towers	24/44 (54)	Oxford
Chillers, swamp coolers and sumps	10/15 (83)	Oxford
Decorative fountains, ornamental waterfalls and spa	3/23 (13)	Oxford
Municipal, local, industrial and commercial water sources	4/30 (9)	Oxford
Total	41/119 (34)	

Where's the Benidorm?

Epidemiologic investigation

- Case definition: A resident or visitor to City X who was diagnosed with clinical or radiographic pneumonia since May 1, 2005 with laboratory confirmation of Legionnaires' disease
- Matched case-control study conducted

Risk factors for Legionnaires' disease among outbreak cases

Activity	Cases (%) N=13*	Controls (%) N=52*	Matched OR	95%CI
Visited any restaurant	13/13 (100)	29/52 (56)	17.7	2.5- ∞
Reported eating in Restaurant A	6/11 (55)	0/44 (0)	32.7	4.7- ∞



What did we learn?

- Epidemiologic investigations can lead to sources not previously considered
- When the epidemiologic findings do not lead to a microbiologically-confirmed source, do more epi, not less
- Molecular isolate characterization from case-patients and the environment can provide crucial evidence

Outbreak example #2

Will the *real*/source of the outbreak please stand up?



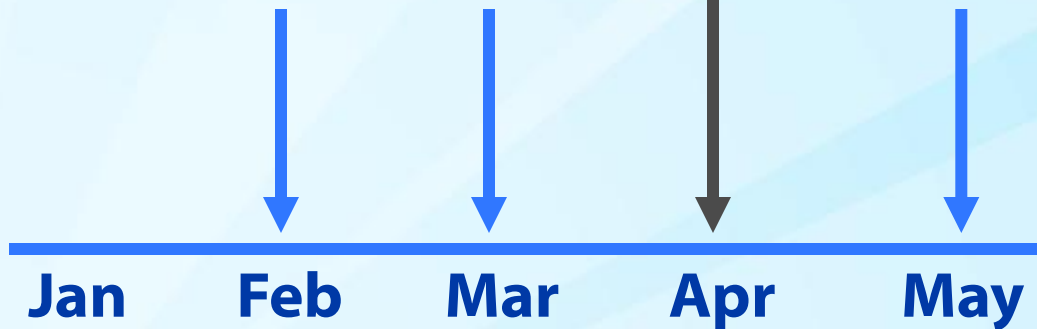
Outbreak of Legionnaires' disease associated with a time-share condominium, 2001

**LP1 found in
cooling towers,
Repairs done**

**Case 1:
State A**

**Case 2:
State B**

**Case 3:
State C**



2001



Environmental results

- Water temperatures and disinfectant concentrations conducive to *Legionella* growth throughout complex
- *L. pneumophila* isolated from multiple locations
- *L. pneumophila* serogroup 1 identical to clinical isolate
 - Whirlpool spa
 - Potable water of Tower 2



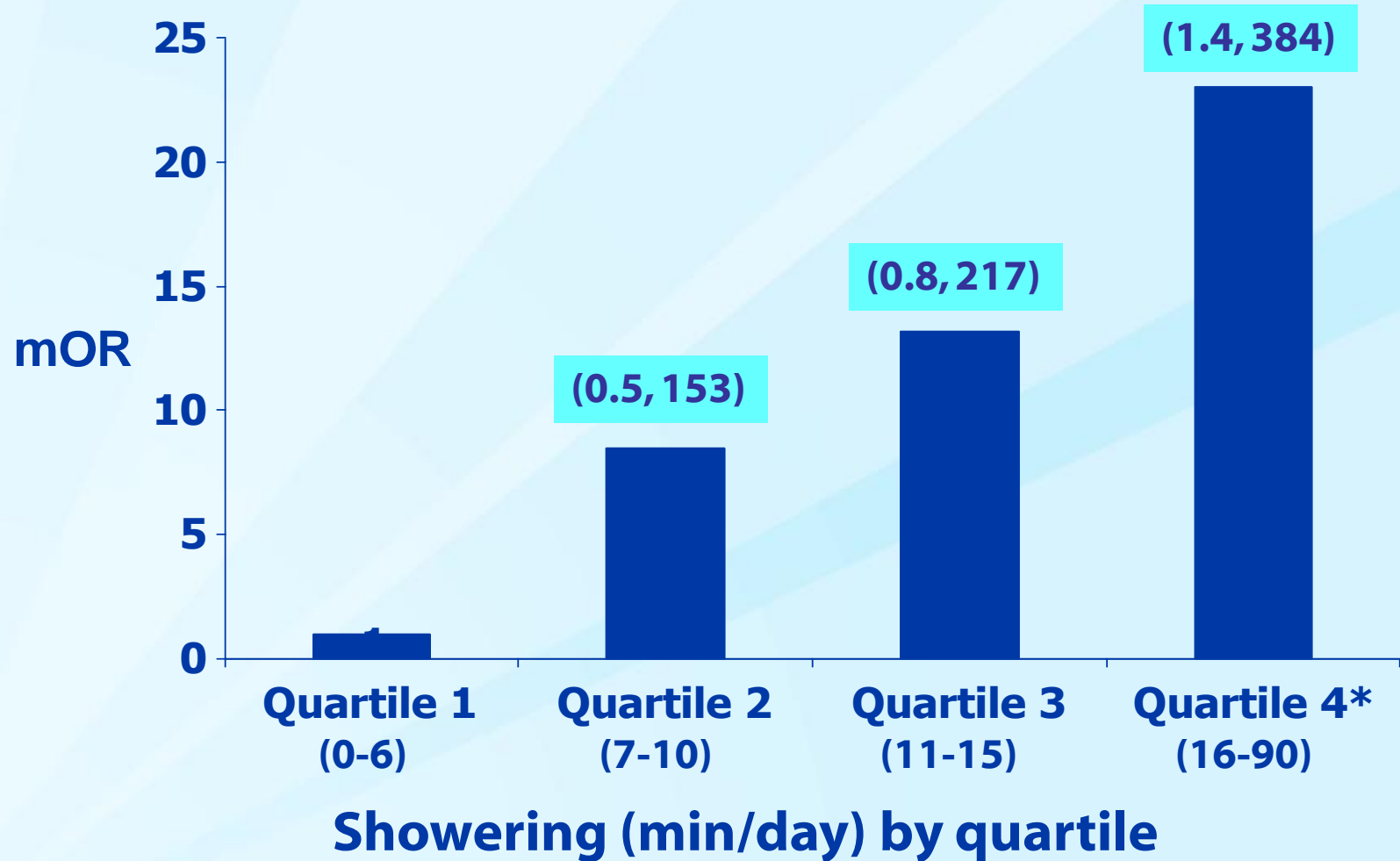
Epidemiologic investigation

- Case finding: >16,000 letters to all guests registered Jan 1 – Aug 10
- Case-control study
 - Confirmed and possible cases
 - 4 controls /case matched on date of arrival
 - 2 sets of controls for case-patients in tower 2
 - Telephone questionnaire

Risk factors for Legionnaires' disease

Exposure	Cases (N=18)	Controls (N=91)	mOR	95% CI
Pool	6 (33%)	19 (21%)	2.3	0.7-7.8
Cabanas	9 (50%)	31 (34%)	1.9	0.7-5.3
Whirlpool	6 (33%)	21 (23%)	1.9	0.6-5.7
Time on Roof	13 (72%)	55 (62%)	1.6	0.5-5.1
Room in tower 2	15 (83%)	41 (45%)	6.1	1.6 – 22.9

Dose response relationship between showering & risk of Legionnaires' disease



* $p = .029$ for quartile 4 versus quartile 1

What did we learn?

- Epidemiologic investigations can shed light on the most likely source when the microbiology leads to >1 source (potable water > spa)
- Epidemiologic data can point to the actual route of transmission (showering)

When to consider a case control or cohort study

- Unclear source for the outbreak
- Multiple potential sources for the outbreak
- Potential to learn something new
- Training opportunity

Resources needed for a comprehensive investigation

- Experience with legionellosis outbreaks
 - Epidemiologic
 - Environmental assessment and sampling
 - Access to a building engineer helpful
- Lab capacity or access to a lab
 - Clinical culture
 - Environmental culture
 - Molecular testing (monoclonal antibody and sequence based typing)
- Lab supplies
- Manpower

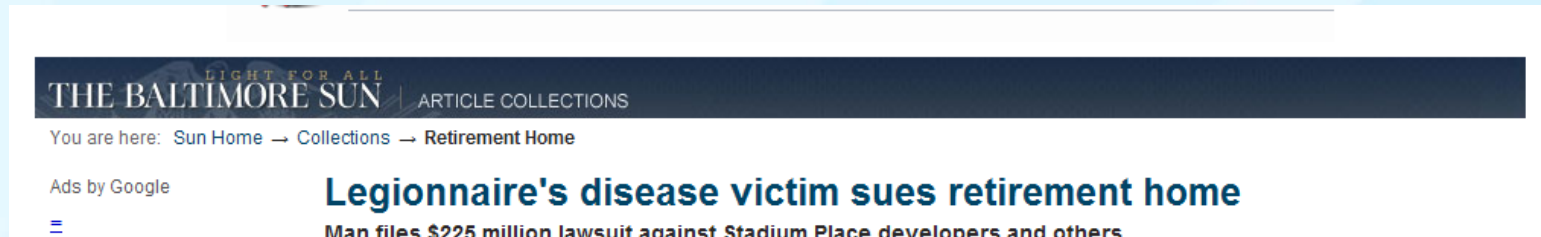
When to consider an Epi-Aid

- Limited experience with *Legionella* outbreaks
 - Epidemiologic
 - Environmental
- Little or infrequent lab experience with *Legionella* environmental and clinical culture
- Need access to molecular techniques for confirming source
- Limited epi and environmental personnel
- Limited funding and supplies
- Training opportunity
- Excessive media or legal attention

Media tips

- Coordinate messaging at local, state and federal levels
 - Ask for help early so that messages remain consistent
 - Prepare SOCOs
- Stress how common *Legionella* are in the environment
 - Just because you found it doesn't mean you know the source for a particular case (i.e., don't jump to conclusions)
 - Many times the outbreak could not have been anticipated
- Dissuade fear by describing the low attack rate and characterizing disease transmission

Legal implications



- Lawsuits are commonplace with legionellosis outbreaks
- Don't be surprised if lawyers contact you directly
- Be prepared for requests for information (e.g., FOIA)
- Businesses often suffer severe consequences even in the absence of negligence

Considerations for legionellosis outbreaks

- The epidemiologic and laboratory components of a legionellosis investigation are equally important and complementary
- How much of each component is needed will vary depending upon the outbreak
- Make sure you have the appropriate resources on hand
- Be prepared for media and legal requests



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